CLAIMS

What is claimed is:

1. A system comprising:

a first photo-detector array configured to obstruct a first predefined portion of at least one defined wavelength of light impinging upon said first photo-detector array;

a second photo-detector array sensitive to the at least one defined wavelength of light, said second photo-detector array positioned proximate to said first photo-detector array; and

at least one cascade of N gain elements operably couplable with at least one of said first photo-detector array and said second photo-detector array, the at least one cascade having at least

N greater than or equal to a positive integer sufficient to provide said at least one cascade with a gain such that a predetermined operable signal at an input of said at least one cascade generates a signal at an output of said at least one cascade that is larger than a predetermined operable threshold value,

an input of a first gain element of said at least one cascade operably couplable with the at least one of said first photo-detector array and said second photo-detector array, and

a gain element of the at least one cascade having a gain larger than one by an amount such that a noise factor of said at least one cascade operating on the

predetermined operable signal at the input of said at least one cascade is substantially minimized.

2. The system of Claim 1, wherein said first photo-detector array configured to obstruct a first predefined portion of at least one defined wavelength of light impinging upon said first photo-detector array further comprises:

at least one of a charge coupled device (CCD) array and a complementary metal oxide semiconductor (CMOS) array.

3. The system of Claim 1, wherein said first photo-detector array configured to obstruct a first predefined portion of at least one defined wavelength of light impinging upon said first photo-detector array further comprises:

at least one photo-detector in said first photo-detector array constructed to provide an optical filter having a passband including at least one of a red, a blue, and a green visible light wavelength.

4. The system of Claim 1, wherein said first photo-detector array configured to obstruct a first predefined portion of at least one defined wavelength of light impinging upon said first photo-detector array further comprises:

at least one photo-detector in said first photo-detector array constructed to provide a substantially neutral density filter.

5. The system of Claim 1, wherein said first photo-detector array configured to obstruct a first predefined portion of at least one defined wavelength of light impinging upon said first photo-detector array further comprises:

at least one photo-detector in said first photo-detector array constructed to provide a substantially neutral density filter that decreases an intensity of light energy without substantially altering a relative spectral distribution of an unobstructed portion of the light energy.

6. The system of Claim 1, wherein said first photo-detector array configured to obstruct a first predefined portion of at least one defined wavelength of light impinging upon said first photo-detector array further comprises:

at least one photo-detector in said first photo-detector array constructed to provide a substantially neutral density filter that filters an entire visible spectrum substantially evenly without substantially influencing at least one of color and contrast of an unobstructed portion of the entire visible spectrum.

7. The system of Claim 1, wherein said first photo-detector array configured to obstruct a first predefined portion of at least one defined wavelength of light impinging upon said first photo-detector array further comprises:

at least one photo-detector in said first photo-detector array constructed to provide a substantially neutral density filter that utilizes at least one of absorption and reflection.

8. The system of Claim 1, wherein said first photo-detector array configured to obstruct a first predefined portion of at least one defined wavelength of light impinging upon said first photo-detector array further comprises:

at least one photo-detector in said first photo-detector array constructed to provide a substantially neutral density filter that filters substantially ½ of the light impinging upon said first photo-detector.

9. The system of Claim 1, wherein said first photo-detector array configured to obstruct a first predefined portion of at least one defined wavelength of light impinging upon said first photo-detector array further comprises:

at least one photo-detector in said first photo-detector array constructed to provide a substantially neutral density filter that filters a defined portion of photons at least partially composing the light impinging upon said first photo-detector.

10. The system of Claim 1, wherein said second photo-detector array sensitive to the at least one defined wavelength of light, said second photo-detector array positioned proximate to said first photo-detector array further comprises:

said second photo-detector array configured to obstruct a second predefined portion of the at least one defined wavelength of light impinging upon said second photo-detector.

11. The system of Claim 10, wherein said second photo-detector array configured to obstruct a second predefined portion of the at least one defined wavelength of light impinging upon said second photo-detector further comprises:

at least one of a charge coupled device (CCD) array and a complementary metal oxide semiconductor (CMOS) array.

12. The system of Claim 10, wherein said second photo-detector array configured to obstruct a second predefined portion of the at least one defined wavelength of light impinging upon said second photo-detector further comprises:

at least one photo-detector in said second photo-detector array constructed to provide an optical filter having a passband including at least one of a red, a blue, and a green visible light wavelength.

13. The system of Claim 10, wherein said second photo-detector array configured to obstruct a second predefined portion of the at least one defined wavelength of light impinging upon said second photo-detector further comprises:

at least one photo-detector in said second photo-detector array constructed to provide a substantially neutral density filter.

14. The system of Claim 10, wherein said second photo-detector array configured to obstruct a second predefined portion of the at least one defined wavelength of light impinging upon said second photo-detector further comprises:

at least one photo-detector in said second photo-detector array constructed to provide a substantially neutral density filter that decreases an intensity of light energy without substantially altering a relative spectral distribution of an unobstructed portion of the light energy.

15. The system of Claim 10, wherein said second photo-detector array configured to obstruct a second predefined portion of the at least one defined wavelength of light impinging upon said second photo-detector further comprises:

at least one photo-detector in said second photo-detector array constructed to provide a substantially neutral density filter that filters an entire visible spectrum substantially evenly without substantially influencing at least one of color and contrast of an unobstructed portion of the entire visible spectrum.

16. The system of Claim 10, wherein said second photo-detector array configured to obstruct a second predefined portion of the at least one defined wavelength of light impinging upon said second photo-detector further comprises:

at least one photo-detector in said second photo-detector array constructed to provide a substantially neutral density filter that utilizes at least one of absorption and reflection.

17. The system of Claim 10, wherein said second photo-detector array configured to obstruct a second predefined portion of the at least one defined wavelength of light impinging upon said second photo-detector further comprises:

at least one photo-detector in said second photo-detector array constructed to provide a substantially neutral density filter that filters substantially ½ of the light impinging upon said second photo-detector.

18. The system of Claim 10, wherein said second photo-detector array configured to obstruct a second predefined portion of the at least one defined wavelength of light impinging upon said second photo-detector further comprises:

at least one photo-detector in said second photo-detector array constructed to provide a substantially neutral density filter that filters a defined portion of photons at least partially composing the light impinging upon said photo-detector.

19. The system of Claim 1, wherein said second photo-detector array sensitive to the at least one defined wavelength of light, said second photo-detector array positioned proximate to said first photo-detector array further comprises:

said first photo-detector array having a light-receiving surface and a light-transmitting surface; and

said second photo-detector array having a light-receiving surface proximate to the light-transmitting surface of said first photo-detector.

20. The system of Claim 1, wherein said second photo-detector array sensitive to the at least one defined wavelength of light, said second photo-detector array positioned proximate to said first photo-detector array further comprises:

said first photo-detector array having a light-receiving surface and a light-transmitting surface; and

said second photo-detector array having a light-receiving surface facing the light-transmitting surface of said first photo-detector.

21. The system of Claim 1, wherein said second photo-detector array sensitive to the at least one defined wavelength of light, said second photo-detector array positioned proximate to said first photo-detector array further comprises:

said second photo-detector array having at least one photo-detector in substantial alignment with at least one photo-detector of said first photo-detector array.

22. The system of Claim 1, wherein said second photo-detector array sensitive to the at least one defined wavelength of light, said second photo-detector array positioned proximate to said first photo-detector array further comprises:

a spectrally-dependent filter interposed between said first and said second photo-detector arrays.

23. The system of Claim 1, wherein said N greater than or equal to a positive integer sufficient to provide said at least one cascade with a gain such that a predetermined operable signal at an input of said at least one cascade generates a signal at an output of

said at least one cascade that is larger than a predetermined operable threshold value further comprises:

said N is greater than or equal to a positive integer sufficient to provide said at least one cascade with a gain such that a substantially minimally rated output signal of a photo-detector array applied to the input of said at least one cascade generates a signal at the output of said at least one cascade that is larger than the predetermined threshold value.

24. The system of Claim 1, wherein said N greater than or equal to a positive integer sufficient to provide said at least one cascade with a gain such that a predetermined operable signal at an input of said at least one cascade generates a signal at an output of said at least one cascade that is larger than a predetermined operable threshold value further comprises:

said N is greater than or equal to a positive integer sufficient to provide said at least one cascade with a gain such that a predetermined signal at an input of said at least one cascade generates a signal at the output of said at least one cascade that is larger than a substantially minimally rated input of a display circuit.

25. The system of Claim 1, wherein the gain larger than one by an amount such that a noise factor of said at least one cascade operating on the predetermined operable signal at the input of said at least one cascade is substantially minimized further comprises:

a noise factor defined as the ratio of a Signal Power to Thermal Noise ratio at the input_of said at least one cascade to an amplified Signal Power to Thermal Noise ratio at the output of the at least one cascade: $(S_{input}/N_{input})/(S_{output}/N_{output})$..

26. The system of Claim 1, wherein the gain larger than one by an amount such that a noise factor of said at least one cascade operating on the predetermined operable signal at the input of said at least one cascade is substantially minimized further comprises:

a noise factor defined as a ratio of an output noise power of said at least one cascade to the portion thereof attributable to thermal noise in an input termination at standard noise temperature.

27. The system of Claim 1, wherein the gain larger than one by an amount such that a noise factor of said at least one cascade operating on the predetermined operable signal at the input of said at least one cascade is substantially minimized further comprises:

a noise factor defined as a ratio of actual output noise to that which would remain if the at least one cascade itself did not introduce noise.

28. The system of Claim 1, wherein the gain larger than one by an amount such that a noise factor of said at least one cascade operating on the predetermined operable signal at the input of said at least one cascade is substantially minimized further comprises:

the gain larger than one but less than 1.001.

29. The system of Claim 1, wherein the gain larger than one by an amount such that a noise factor of said at least one cascade operating on the predetermined operable signal at the input of said at least one cascade is substantially minimized further comprises:

the gain larger than one but less than 1.01.

30. The system of Claim 1, wherein the gain larger than one by an amount such that a noise factor of said at least one cascade operating on the predetermined operable signal at the input of said at least one cascade is substantially minimized further comprises:

the gain of a gain element is larger than one by an amount that is practicably small such that the noise contribution to the low noise amplifier from a gain element is substantially minimized.

31. The system of Claim 1, wherein said gain element of the at least one cascade having a gain larger than one by an amount such that a noise factor of said at least one cascade operating on the predetermined operable signal at the input of said at least one cascade is substantially minimized further comprises:

an impact ionization-based amplifier having a gain larger than one by an amount such that the noise factor of said at least one cascade operating on the predetermined signal at the input of said cascade is substantially minimized.

32. The system of Claim 31, wherein said impact ionization-based amplifier further comprises:

a solid state electron multiplying amplifier.

33. The system of Claim 1, wherein said gain element of the at least one cascade having a gain larger than one by an amount such that a noise factor of said at least one cascade operating on the predetermined operable signal at the input of said at least one cascade is substantially minimized further comprises:

an over-biased amplifier.

34. The system of Claim 1, wherein said gain larger than one by an amount such that a noise factor of said at least one cascade operating on the predetermined operable signal at the input of said at least one cascade is substantially minimized further comprises:

the gain larger than one by an amount such that the noise factor of said at least one cascade operating on the predetermined signal at the input of said at least one cascade is less than 1.2.

35. The system of Claim 1, further comprising:

one or more output value detection circuits respectively operably coupled with one or more outputs of the N gain elements.

36. The system of Claim 35, wherein said one or more output value detection circuits respectively operably coupled with one or more outputs of the N gain elements further comprises:

one or more comparators respectively operably coupled with one or more outputs of the N gain elements.

37. The system of Claim 35, wherein said one or more output value detection circuits respectively operably coupled with one or more outputs of the N gain elements further comprises:

M comparators operably coupled with M gain elements of the at least one cascade, wherein M is an integer that is less than or equal to N; and

M reference values operably coupled with said M comparators.

38. A method of constructing a system comprising:

forming a first photo-detector array configured to obstruct a first predefined portion of at least one defined wavelength of light impinging thereupon;

forming a second photo-detector array sensitive to the at least one defined wavelength of light in a vicinity of the first photo-detector array;

configuring a first gain element such that an input of the first gain element is operable to receive an input signal from at least one of the first photo-detector array and the second photo-detector array;

connecting an output of a k'th gain element to an input of a k+1'th gain element, wherein k is an integer that is at least 1;

configuring an N'th gain element of a cascade of N gain elements such that an output of the N'th gain element is operable to generate an output signal; and

N being a positive integer such that a ratio between the output signal and the input signal is larger than a predetermined threshold gain when the input signal is received at the input of the first gain element.

39. The method of Claim 38, wherein said forming a first photo-detector array configured to obstruct a first predefined portion of at least one defined wavelength of light impinging thereupon comprises:

forming a charge coupled device (CCD) array that includes at least one charge coupled device permeable to a first defined portion of light impinging thereupon.

40. The method of Claim 38, wherein said forming a first photo-detector array configured to obstruct a first predefined portion of at least one defined wavelength of light impinging thereupon comprises:

forming a complementary metal oxide semiconductor (CMOS) array that includes at least one complementary metal oxide semiconductor permeable to a first defined portion of light impinging thereupon.

41. The method of Claim 38, wherein said forming a first photo-detector array configured to obstruct a first predefined portion of at least one defined wavelength of light impinging thereupon comprises:

constructing at least one photo-detector in the first photo-detector array to provide an optical filter having a passband including at least one of a red, a blue, and a green visible light wavelength.

42. The method of Claim 38, wherein said forming a first photo-detector array configured to obstruct a first predefined portion of at least one defined wavelength of light impinging thereupon comprises:

constructing at least one photo-detector in the first photo-detector array to provide a substantially neutral density filter.

43. The method of Claim 38, wherein said forming a second photo-detector array sensitive to the at least one defined wavelength of light comprises:

forming a charge coupled device (CCD) array that includes at least one charge coupled device permeable to a second defined portion of light impinging thereupon.

44. The method of Claim 38, wherein said forming a second photo-detector array sensitive to the at least one defined wavelength of light comprises:

forming a complementary metal oxide semiconductor (CMOS) array that includes at least one complementary metal oxide semiconductor permeable to a second defined portion of light impinging thereupon.

45. The method of Claim 38, wherein said forming a second photo-detector array sensitive to the at least one defined wavelength of light comprises:
constructing at least one photo-detector in the second photo-detector array to provide an optical filter having a passband including at least one of a red, a blue, and a green visible light wavelength.

46. The method of Claim 38, wherein said forming a second photo-detector array sensitive to the at least one defined wavelength of light comprises:

constructing at least one photo-detector in the second photo-detector array to provide a substantially neutral density filter.

47. The method of Claim 38, wherein said forming a second photo-detector array sensitive to the at least one defined wavelength of light comprises:

constructing at least one photo-detector in the second photo-detector array to have substantial alignment with at least one photo-detector in the first photo-detector array.

48. The method of Claim 38, further comprising:

positioning a light-transmitting surface of a photo-detector in the first photo-detector array proximate to a light-receiving surface of a photo-detector in the second photo-detector array.

49. The method of Claim 38, wherein said forming a second photo-detector array sensitive to the at least one defined wavelength of light comprises:

interposing a spectrally-dependent filter between said first and said second photo-detector arrays.

50. The method of Claim 38, wherein at least one gain element has a gain larger than one but less than 1.001.

51. The method of Claim 38, wherein at least one gain element has a gain larger than one but less than 1.01.

52. The method of Claim 38, wherein at least one gain element has a gain generated based on an impact ionization process.

53. The method of Claim 38, wherein at least one gain element has a gain that is provided by over biasing the gain element.

54. The method of Claim 38, wherein at least one gain element comprises a solid state electron multiplying amplifier.

55. The method of Claim 38, wherein the at least one gain element has a gain larger than one by an amount such that a noise factor of the N gain elements is practicably minimized.

56. The method of Claim 38, further comprising connecting one or more outputs of N gain elements respectively to one or more value detection circuits.

57. The method of Claim 56, wherein said connecting one or more outputs of N gain elements respectively to one or more value detection circuits further comprises:

operably coupling M comparators with M gain elements of the at least one cascade, wherein M is an integer that is less than or equal to N; and

operably coupling M reference values with the M comparators.

58. A method of detecting light comprising:

obstructing a first predefined portion of at least one defined wavelength of light incident upon a first photo-detector array;

detecting the at least one defined wavelength of light with a photo-detector in a second photo-detector array and

receiving at least one signal representative of the least one defined wavelength of light with at least one cascade of N gain elements operably coupled with at least one of the first photo-detector array and the second photo-detector array, the at least one cascade having at least

N greater than or equal to a positive integer sufficient to provide said at least one cascade with a gain such that a predetermined operable signal at an input of said at least one cascade generates a signal at an output of said at least one cascade that is larger than a predetermined operable threshold value,

an input of a first gain element of said at least one cascade operably couplable with the at least one of the first photo-detector array and the second photo-detector array, and

a gain element of the at least one cascade having a gain larger than one by an amount such that a noise factor of said at least one cascade operating on the predetermined operable signal at the input of said at least one cascade is substantially minimized.

59. The method of Claim 58, wherein said obstructing a first predefined portion of at least one defined wavelength of light comprises:

obstructing the first predefined portion of the light with a charge coupled device (CCD) in the first photo-detector array.

60. The method of Claim 58, wherein said obstructing a first predefined portion of at least one defined wavelength of light comprises:

obstructing the first predefined portion of the light with a complementary metal oxide semiconductor (CMOS) in the first photo-detector array.

61. The method of Claim 58, wherein said obstructing a first predefined portion of at least one defined wavelength of light comprises:

obstructing the first predefined portion of the light with a photo-detector in the first photo-detector array without substantially altering a relative spectral distribution of energy in a second unobstructed predefined portion of the light.

62. The method of Claim 58, wherein said detecting the at least one defined wavelength of light with a photo-detector in a second photo-detector array comprises:

detecting the at least one defined wavelength of light with a charge coupled device (CCD) in the second photo-detector array.

63. The method of Claim 58, wherein said detecting the at least one defined wavelength of light with a photo-detector in a second photo-detector array comprises:

detecting the at least one defined wavelength of light with a complementary metal oxide semiconductor (CMOS) in the second photo-detector array.

64. The method of Claim 58, further comprising:

obstructing a second predefined portion of the light with a photo-detector in the second photo-detector array.

65. The method of Claim 58, further comprising:

calculating an inferred brightness of light incident upon the first photo-detector.

66. The method of Claim 65, wherein said calculating an inferred brightness of light incident upon the first photo-detector further comprises:

calculating the inferred brightness of light incident upon the first photo-detector array in response to light incident upon the second photo-detector array.

67. The method of Claim 58, further comprising:

selecting one or more calculated inferred brightnesses of light incident upon the first photo-detector array as more probable inferences.

68. The method of Claim 67, wherein said selecting one or more calculated inferred brightnesses of light incident upon the first photo-detector array as more probable inferences further comprises:

selecting one or more calculated inferred brightnesses of light incident upon the first photo-detector array as more probable inferences in response to at least one photo-detector indicating a saturation.

69. The method of Claim 67, wherein said selecting one or more calculated inferred brightnesses of light incident upon the first photo-detector array as more probable inferences further comprises:

selecting one or more calculated inferred brightnesses of light incident upon the first photo-detector array as more probable inferences in response to at least two calculated brightnesses of light incident upon the first photo-detector array.

70. The method of Claim 58, further comprising:

detecting that a first gain element output of N gain elements in a cascade is below a first predefined threshold; and

determining a digital conversion value in response to a detection that a second gain element output of the N gain elements in the cascade is above a second predefined threshold greater than the first predefined threshold.